Materials Tip

Materials Engineering Branch

Use of Tedlar (polyvinyl fluoride) as a Thermal Blanket Material			
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Due to its thermal and optical properties, Tedlar (manufactured by DuPont) has recently become a candidate for spacecraft thermal blankets. If coated with a metal oxide layer, Tedlar is a very good ultra-violet and atomic oxygen resistant material.

Studies done by the Materials Engineering Branch at Goddard Space Flight Center have found that White Tedlar has problems with shrinkage if exposed to temperatures of +150°C or higher. These studies were performed on sheet material 1.5 to 2.0 mils thick. When exposed to a temperature of 150°C, the Tedlar specimens would typically have a reduction in surface area of 50 to 70% accompanied by an increase in thickness. It is suspected that heating to 150°C breaks the C-F bonds in the Tedlar, which may also degrade its UV and AO resistant properties. As fluorine is a highly reactive gas, the fluorine released may react with and/or corrode spacecraft components. Therefore, it is not desirable to pre-shrink Tedlar or expose it to temperatures above 125°C.

Tedlar can be purchased with its surfaces treated to make it more bondable, glossy, flat, etc. If Tedlar is purchased with a surface finish, it is important to make sure that both sides are treated and have the same finish. When heated to 85°C or above, the Tedlar specimens, with only one side treated, curled severely.

When exposed to temperatures of 190°C or above, Tedlar discolors as well.
In conclusion, the following precautions need to followed when using Tedlar.

1. Don't expose the material to temperatures in excess of 125°C. This may require shielding against thrusters and other heat sources on a spacecraft.

2. When purchasing Tedlar, make certain that both sides of the material have the same surface finish.

3. If pre-shrinking is attempted, take precautions not to expose hardware and operators to the fluorine gas. In general, pre-shrinking is not recommended since it may degrade the desirable properties of the Tedlar and the shrinkage properties vary from lot to lot.